Fisheries & Wildlife Management Division

RESOURCE STATUS AND ASSESSMENT BRANCH

2000/2001 Brassy Minnow (*Hybognathus hankinsoni*) Inventory at Musreau Lake and outlet

Alberta Species at Risk Report No. 6

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2000/2001 Brassy Minnow (*Hybognathus hankinsoni*) Inventory at Musreau Lake and outlet

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DISCLAIMER

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EXECUTIVE SUMMARY

Decline of a population over time can be the result of numerous factors including species over-harvest, loss of habitat, predation or competition. However, when populations become small and are isolated from other populations, fluctuations in the environment and chance events can play a very important role in determining population persistence over time (local extinction). Brassy minnow (*Hybognathus hankinsoni*) in Musreau Lake, Alberta are both localized and isolated from other known brassy minnow populations.

This report investigates the present population of brassy minnow in Musreau Lake through detailed sampling, previous documented occurrences in the lake and expected presence based on pertinent literature. Brassy minnow, once believed to be ubiquitous across British Columbia and Alberta occur as remnant populations today. With a better understanding of important factors influencing survival, management strategies can be developed to ensure this species continues to persist in northwestern Alberta.

1.0 INTRODUCTION

The brassy minnow (*Hybognathus hankinsoni*) population in Musreau Lake, Alberta may be at risk of extirpation. I attempt to assess this risk and determine factors important for maintaining this population's persistence through time. This assessment will look at the present population structure of brassy minnow and their habitat requirements.

Musreau Lake is located south of Grande Prairie, Alberta, and is one of only four places where brassy minnow are known to occur within the province. Distribution of this species, while extensive in eastern Canada and north-eastern United States, is restricted to the Milk River (Missouri drainage) and two locations in the Athabasca River drainage, in Alberta (Berry 1977, McAllister 1962, Nelson and Paetz 1992, Willock 1968). Brassy minnow presence in Musreau Lake is important because this location lies between a northern British Columbia population (near Prince George and Williams Lake, B.C) and those located in the Milk and Athabasca rivers, suggesting historical wide spread distribution (Bishop 1975). The two known populations of brassy minnow in British Columbia are considered to be at risk (B.C. Ministry of Fisheries unpubl. data). Now it appears that only localized, remnant populations exist. As populations such as this become small, many factors, including changes in the environment, may alter species survival to a point where these changes alone become the determining factor that decides the fate of a population (Lacy 1996). The status of brassy minnow (e.g. endangered, threatened, special concern) across the province has yet to be determined.

Impacts to this brassy minnow population have not been accounted for in previous management strategies created for Musreau Lake. In the early 1970's, rainbow trout (a non-indigenous species) were stocked in the lake to promote angling opportunities close to Grande Prairie (Alberta Environment unpubl. data). At the time of this decision, no effort was made to determine the direct or indirect effects this may have had on the brassy minnow population. Future management decisions must incorporate the effects an alternative species will have on these minnows to better evaluate the efficacy of these decisions. One useful technique to do this is population viability analysis (PVA). PVA would allow us to adapt our management strategies and prevent potential adverse impacts new strategies may have on brassy minnow (Boyce 1992).

Specific objectives of this report are to (1) document biological information on brassy minnow (population density and habitat requirements) in Musreau Lake and the literature and (2) identify possible management strategies based upon these results.

2.0 STUDY AREA

Musreau Lake is a 575 hectare natural water body located approximately 70 km south of Grande Prairie (Figure 1, Plate 1). Species assemblage includes burbot (*Lota lota*), white and longnose suckers (*Catostomus spp*), Lake Chub (*Couesius plumbeus*), and introduced rainbow trout (*Onchorychus mykiss*). Recently, bull trout (*Salvelinus confluentus*) have been captured in the lake, likely ascending from the Kakwa River

through Musreau Creek, the only outlet of the lake (Hvenegaard and Fairless 1998). Previous attempts (since 1972) to create a viable rainbow trout fishery have been unsuccessful despite repeated stocking of trout at approximately 280 fish/ha, which ranged in size from 40 to 170 mm (Wright 1996, Hvenegaard and Fairless 1998).

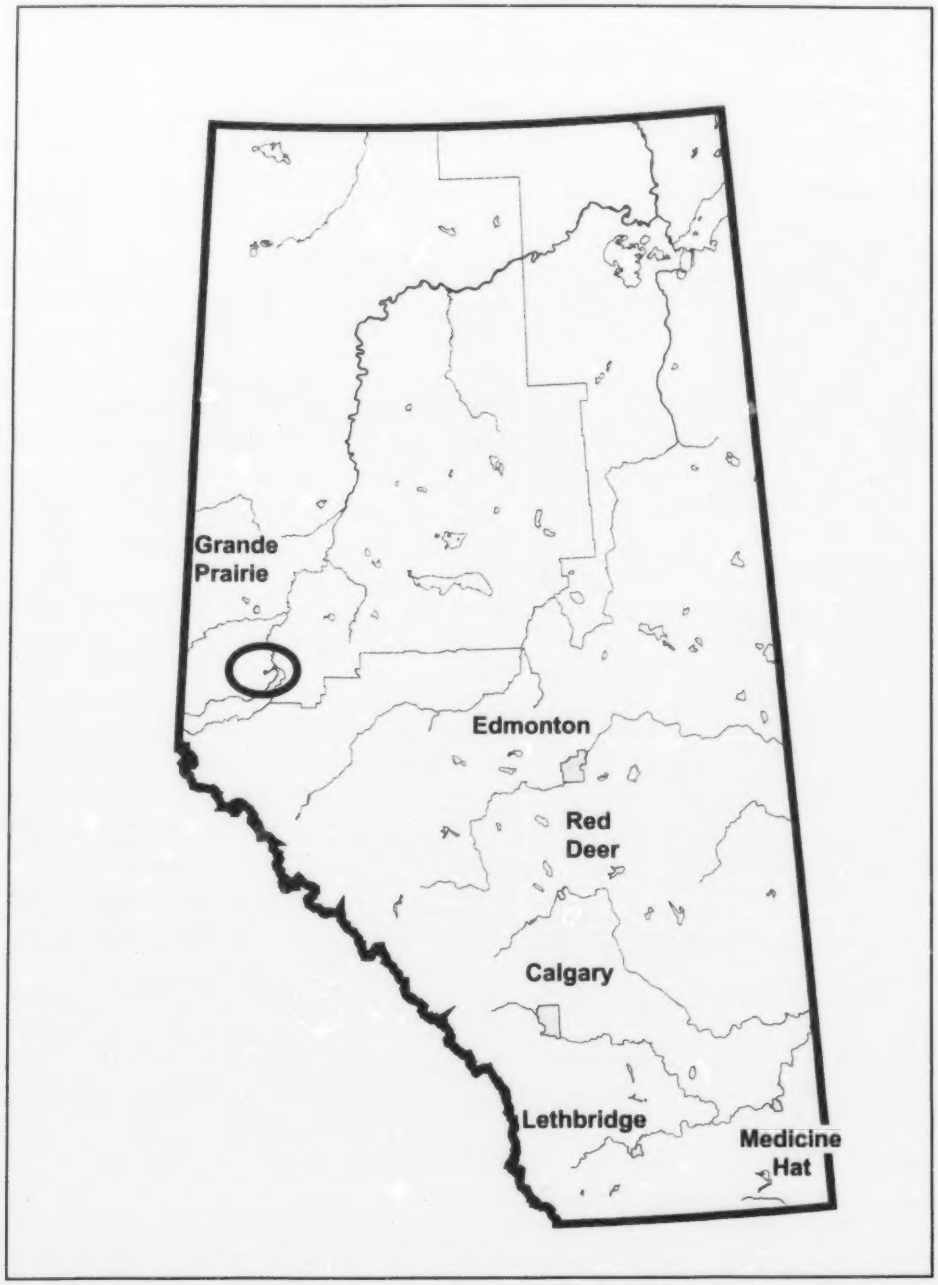

Figure 1. Study area. Shaded area indicates extent of the Northwest Boreal Region. The circle indicates approximate location of Musreau Lake.

3.0 METHODS

A literature review of brassy minnow life history, including to a review of government documents, was conducted to identify compatibility with other species. Historic accounts of brassy minnow in Musreau Lake have been confined to the outlet (Musreau Creek) and surrounding areas. Moller (unpubl. data) reported captures in excess of a 1000 brassy minnow from minnow trap sets at the outlet and additional captures in the shallows at the west-end of the lake. Therefore, sampling locations in this study were designed to incorporate these known capture locations, influences of flowing water (inlet and outlet) and a variety of habitat types (aquatic vegetation, substrate type, Figure 2). In-stream electrofishing, baited minnow traps and seining were used as capture techniques. Electrofishing equipment consisted of a Smith-Root™ 12 POW backpack unit and minnow traps, baited with bread. Intended sampling times included spring, summer, fall and winter, however only the summer and fall sampling timeframes were achieved. The spring time frame was expected to yield the most captures, based on Moller's captures from 1993 and concentration of minnows in suitable spawning habitats. All data collected was loaded and stored in the Provincial Fisheries Management Information System (FMIS).

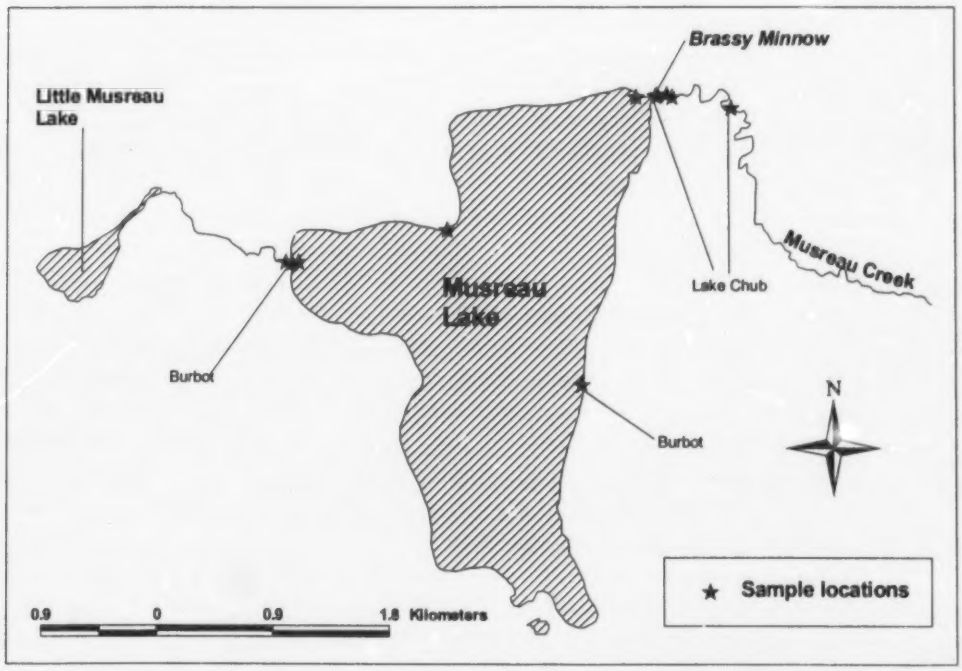

Figure 2. Detailed lake map indicating minnow trap sampling locations and species collections

4.0 RESULTS

4.1 Brassy Minnow Life History

The ecology of brassy minnow has not been well documented. Ubiquitous across eastern Canada and the U.S., it is commonly referred to only as forage or bait fish (Copes unknown). Brassy minnow typically reside in small, weedy creeks or streams with sand, gravel or mud bottoms. They can also be found in boggy lakes, sloughs or overflow ponds near rivers. In winter, they tend to use pools and deep runs under cover or woody debris. Brassy minnow reach sexual maturity at the age of 1 or 2 years. Spawning typically occurs in June and females usually lay their eggs in late spring among the vegetation in shallow areas of streams or lakes. Female fecundity ranges from 150 to 600 eggs depending on female size. Eggs are scattered on vegetation or bottom substrate and take 7 to 10 days to hatch. Few brassy minnow live beyond three years (B.C. Ministry of Fisheries unpubl. data). Predator presence, both fish and birds, has a negative effect on minnow presence. Brassy minnow are found in large numbers only when predators are absent.

Little information is available on specific predatory effects on minnow survival and abundance. However Schlosser (1988) reported a contrast in habitat types selected by brassy minnow in the presence and absence of predators. The selection of unstructured pools was evident when predators were absent, however, brassy minnow selected structurally complex pools in the presence of a small predator (creek chub, *Semotilus atromaculatus*). In the case of a larger predator such as smallmouth bass (*Micropterus dolomieui*), brassy minnow habitat selection was confined to faster flowing water by the selection of raceway or riffle refugia. This is consistent with the hypothesis that habitat use and the magnitude of predator avoidance by prey are directly related to the risk of predation posed by different predator taxa (Schlosser 1988).

4.2 Summary of historic brassy minnow data

Very little information is available for the population of brassy minnow in Musreau Lake (see above). Moller (unpubl. data) reported captures in 1993, in excess of 1000 minnows. Using minnow traps and dip netting, 350, 124 and 700 brassy minnows were captured on June 10, 16 and 17, respectively. All captures were located at the outlet to Musreau Creek. In addition, brassy minnows were dip netted in the shallows at the west-end of the lake. During an assessment of rainbow trout escapement in Musreau Lake, Hvenegaard and Fairless (1998) reported only incidental captures of brassy minnow in Musreau Creek, below a series of beaver dams.

4.3 Brassy Minnow Population Assessment

In total, approximately 300 hours of effort were devoted to minnow trapping and 1271 seconds of electrofishing in the outlet creek (300 meters). Seine sampling was restricted to two pulls due to the rapid increase in the depth of the littoral zone. In total, only three species of fish were captured (young-of-the-year burbot, lake chub and brassy minnow). Of all these captures, only one brassy minnow was caught which was 79 mm (Table 1, Figure 2). All fish were captured in baited minnow traps.

Table 1. Summary of species captured at Musreau Lake, 2000

Species	Number captured	Mean fork length (mm)
Brassy minnow	1	79
Lake chub	37	74.3
Burbot	3	89.7

4.4 Brassy Minnow Habitat Assessment

Sampling locations were chosen based on previous capture history and habitat likely to support these minnows. When captures were noted to be low, new locations were assessed to determine extent of minnow use. Table 2 summarizes habitat parameters at each location. Habitat in the vicinity of the brassy minnow captured consisted of silt substrate with a large amount of submerged grass. This habitat type is uniform throughout the outlet stream (Musreau Creek) for approximately 900 meters downstream from the lake. In typical years, beaver dams are common throughout this stretch and may impede movement upstream. In some years, the spring freshet may break these dams, but they are often reconstructed quickly. The inlet channel (west-end) has similar habitat characteristics as the outlet, however despite equal effort spent fishing, no brassy minnow were captured.

5.0 DISCUSSION

The population of brassy minnow in Musreau lake appears to be very small. It is unknown whether captures from this assessment reflect the true population size or whether timing or method of sampling underestimates the numbers of brassy minnow in the lake. The one captured specimen was located in habitat consistent with that from the literature and previous collections. To determine population viability, it is imperitive to collect information on specific vital rates (growth rate, survival rate, fecundity) and monitor population size through time. Other factors including density dependent mortality and survival with predators are also necessary. With the very low number of minnows captured during this assessment, further study is required to gain a better understanding of brassy minnow population parameters. It is recommended that a follow up survey be conducted to expand the habitat inventory and determine brassy minnow abundance. Sampling in June may permit the capture of more minnows and provide a more accurate assessment of population size. In addition, baiting minnow traps with various baits may improve capture success with the expansion of sampling locations in the inlet and outlet areas of Musreau Lake. Increased sampling of Musreau Creek is also required to determine the extent of downstream movement of brassy minnow and whether this species has migrated into the Kakwa River. No captures of brassy minnow have been reported from numerous fish and habitat assessments of streams in the Kakwa River drainage completed under the Cooperative Fisheries Inventory Program (Hvenegaard 1998). This information wili be required to outline the brassy minnow management plan for Musreau Lake. Literature has suggested the importance of habitat complexity in the presence of predators. Maintaining this complexity appears to have important management implications for ensuring brassy minnow presence in the

Table 2. Summary of habitat characteristics at sample locations

Location[a]	Method[b]	Substrate type	Vegetation type	Species caught[c]	Notes
396503 N 6046904 E	M-T	Silt	Submerged grass	BRMN LKCH	Outlet near lake
396355 N 6046902 E	M-T	Silt	Submerged grass	BURB	Near Outlet
393692 N 6045621 E	M-T	Silt	Submerged grass	BURB	Inlet
395936 N 6044670 E	M-T	Cobble	None	BURB	East Shore
397082 N 6046816 E	E-F	Silt/ Gravel	Submerged grass (50%)	No fish captured	Musreau Creek
396583 N 6046919 E	M-T	Silt	Submerged grass	LKCH	Outlet
394898 N 6045874 E	M-T	Cobble/ Gravel	Reeds (100%)	No fish captured	Northwest shore
393643 N 6045622 E	M-T	Silt	Reeds (100%)	No fish captured	Inlet
393741 N 6045627 E	M-T	Silt	Reeds (100%)	No fish captured	Inlet
396629 N 6046897 E	M-T	Silt	Submerged grass	No fish captured	Outlet
396515 N 6046914	M-T	Silt	Submerged grass	No fish captured	Outlet

[a] Locations recorded in UTM
[b] Minnow traps (M-T) and electrofishing (E-F)
[c] BRMN – Brassy minnow, BURB – Burbot, LKCH – Lake chub

lake. Musreau Lake has been suggested as a potential location to develop a more robust recreational fishery for an alternate species, such as walleye. However, based on this assessment, further research will be required to predict the response of another introduction of a top predator into the lake. The ramifications of bull trout presence are yet unknown, however, it is reasonable to suggest that brassy minnow will continue to survive considering they have coexisted with these indigenous species over time. Further research will also be necessary to determine the distribution and status of brassy minnow within the Province.

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Plate 1. Musreau Lake looking west from Musreau Creek outlet

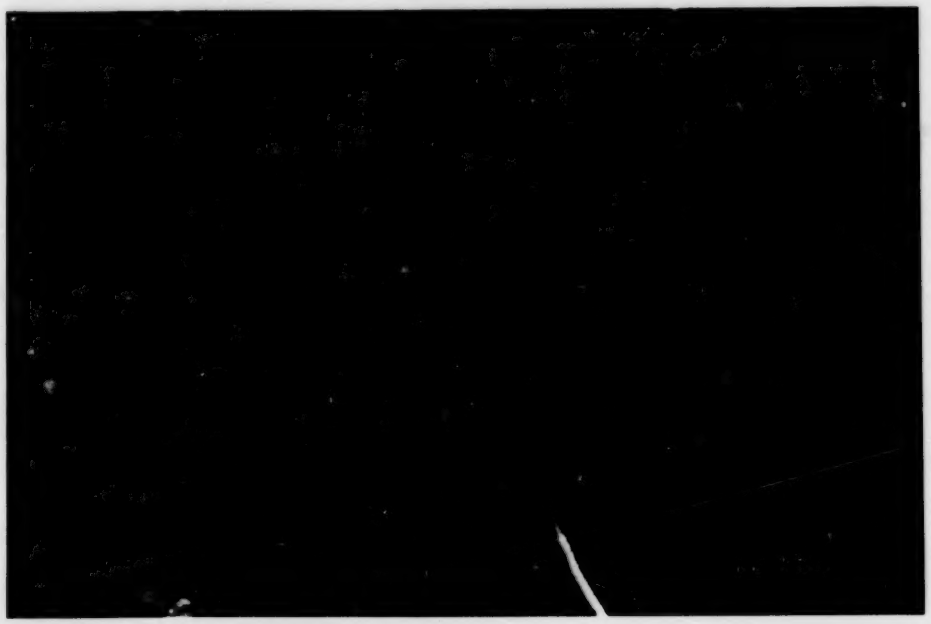

Plate 2. Submerged minnow trap

Plate 3. Only sample of brassy minnow collected during this assessment

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